

**BACHELOR OF ENGINEERING IN  
PRODUCTION ENGINEERING EXAMINATION, 2019  
(1st Year, 1st Semester, Old Syllabus)  
ELECTRICAL TECHNOLOGY**

Time: Three Hours

Full Marks: 100

(50 marks for each part)

Use a separate Answer-script for each Part

**PART-I**

Answer *any three* questions

*Two marks* are reserved for neat and well organized answer script

1. State and prove maximum power transfer theorem. In the following circuit (Fig. 1), for what value of R, maximum power will be delivered? Calculate the maximum power. 16

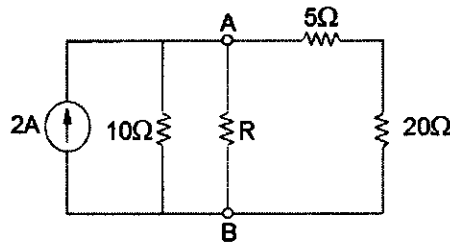


Fig. 1.

2. a) Find the value of total resistance between the nodes A and B of the circuit given in Fig. 2. 8

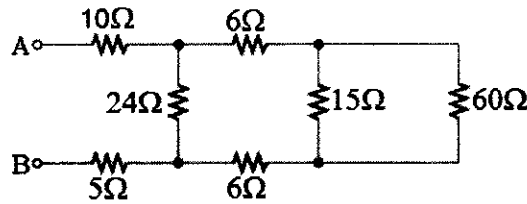


Fig. 2.

- b) Find the currents  $I_1$ ,  $I_2$  and  $I_3$  in Fig. 3 using any method. 8

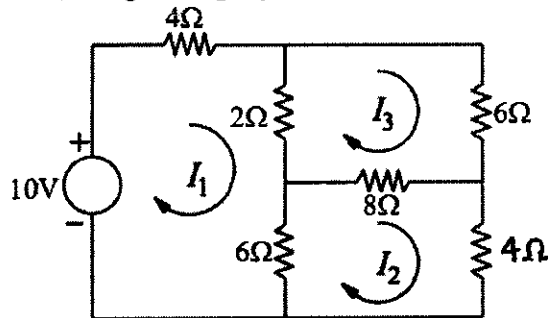


Fig. 3.

3. a) Explain Thevenin's Theorem. With the help of Thevenin's Theorem, find the current through the  $20\Omega$  resistor as shown in Fig. 4. 8

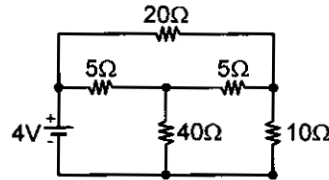


Fig. 4.

- b) A series R-L-C circuit consists of resistance  $R = 10\Omega$ , inductance  $L = 980\text{mH}$  and capacitance  $C = 10\ \mu\text{F}$ . If the applied voltage be  $200\text{V}_{\text{rms}}$  at 50 Hz, determine the current and voltage drops across R, L and C. Draw the necessary phasor diagrams. 8
4. a) Give the similarities and differences between an electric and a magnetic circuit. What do you understand by the term leakage coefficient? 8
- b) A ring has a mean diameter of 10 cm and a cross sectional area of  $1\ \text{cm}^2$ . The ring is made up of cast steel, with having an air gap of 0.1 mm. Find the ampere turns required to produce a flux of  $8 \times 10^{-4}\ \text{Wb}$  in the ring. The relative permeability of cast steel is 800. Neglect magnetic leakage and fringing. 8

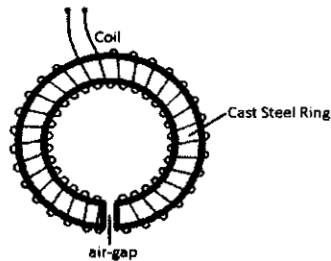


Fig. 5.

5. a) A balanced 3 phase star connected load of  $(2+j6)\ \Omega$  per phase is given a balanced 3 phase supply of 415 V, 50Hz. Find the (i) total active and reactive power consumed and (ii) line and phase currents. Give necessary phasor diagrams. 8
- b) In a three phase circuit under balanced load condition, describe how the total power can be measured with the help of two wattmeters. Give necessary phasor diagrams. 8

**B.E. PRODUCTION ENGINEERING FIRST YEAR FIRST SEMESTER (Old) - 2019****ELECTRICAL TECHNOLOGY****PART- II**

Time: Three hours

(50 marks for each Part)

Full Marks: 100

Answer any **three** questions*Two marks* are reserved for neatness and well organized answers.

1. a) Define a transformer. Discuss the constructions of both core and shell type transformers. (2+8)  
 b) Briefly explain the principle of operation of a transformer. (6)
2. a) With a neat sketch, draw the essential parts of a DC generator. Label the parts. (10)  
 b) Derive the e.m.f equation of a DC generator. (6)
3. a) Derive an expression for air gap power and also the total torque developed for an induction motor. (8)  
 b) Discuss the merits and demerits of SQIM over wound rotor induction machine. (4)  
 c) The frequency of the emf in the stator winding of a 4-pole induction motor is 50 Hz. The motor is running at 1440 rpm. What is the slip and what is the rotor frequency? (4)
4. a) Derive the condition for maximum efficiency of a transformer? (6)  
 b) A 20 KVA, 2500/250 V, 50 Hz single phase transformer has following parameters:  
 $R_2 = 0.06\Omega$ ,  $X_2 = 0.08$ ,  $R_1 = 0.5\Omega$ ,  $X_1 = 0.7\Omega$   
 Draw the equivalent circuit of the transformer referred to the low voltage side. Mention the values of the parameters. Use suitable assumptions. (10)
5. write short notes on : (any two) (8x2)
  - a) Open circuit test of transformer
  - b) Commutation process of DC machine
  - c) Types of excitations in DC machine